THE POTENTIAL FOR NORTHERN PARTICIPATION IN THE EXPLORATION AND DEVELOPMENT OF NON-ENERGY MINERAL MINES IN NORTHERN ALBERTA

Final Report

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Alberta Resource Development
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Executive Summary

Alberta is well known for oil and gas development, however, it is believed that the province also has potential for non-energy minerals. The development of this sector is still in its infancy and very speculative. Non-energy mineral exploration has increased over the past two years but the level of investment is well below its potential. APEX Geoscience Ltd. (APEX) was retained during the summer of 2000 as consultants by the Northern Alberta Development Council (NADC) to conduct a review of the impacts of and the potential for northern participation in the exploration and development of future non-energy mineral mines in Northern Alberta. Key issues and/or concerns raised by northern communities include: lack of information about the opportunities; desire to maximize northern benefits; the need to identify and address barriers to development; manpower requirements and required qualifications for employment; youth, education and training opportunities; social impact on communities and the region; what constitutes a good corporate company, environment, transportation, and aboriginal land issues.

APEX was retained to: (1) develop an overview report (including presentation documents and a PowerPoint slide presentation) on the impact of and the potential for northern participation in the non-energy mineral sector including but not limited to the risks and rewards of mining, the potential impact on land usage and in future land use planning, the potential future benefits of a successful mine or mines and the benefits accrued even during the exploration stages to all local stakeholders including First Nations, Metis Settlements and Northern Communities, (2) complete a consultation process that involves meeting with Northern Community Mayors and Associations, Metis Settlements Leaders, Treaty 8 Regional Council Leaders and the Metis Nation Zone Representatives, (3) present the findings at a symposium to educate aboriginal groups, northern communities and associations in the NADC region, and (4) present the key findings of the consultation process and symposium in a final report.

Statistically, the odds of finding a commercial mineral deposit (i.e.: diamonds, gold, base metals or uranium) in Northern Alberta are good. However, for certain minerals such as diamonds, the odds of finding a viable diamond deposit in northern Alberta are excellent based upon the fact that more than 50% of the discovered kimberlite pipes found to date (a total of 45 kimberlites) in Northern Alberta are reported to be diamondiferous. The development of a viable diamond mine in Northern Alberta is a strong reality and the potential benefits of such should not be ignored even if the development occurs distant from settlement areas or northern communities. The exploration for and development of a diamond deposit in the Buffalo Head Hills could result in significant economic benefit to northern Alberta. Two diamond mines currently being developed in the Northwest Territories (NT) could generate more than 12 billion dollars of total net revenue during the next 25 years. Although diamond exploration is considered extremely high risk due to a lack of prior exploration within certain areas there are geologically favorable settings for the potential discovery of kimberlites in Northern Alberta. Exploration is warranted in many regions of Northern Alberta and diamond indicator sampling conducted in many areas has yielded good quality diamond indicator minerals, a trait considered favorable for the discovery of further kimberlites and a viable diamond mine.

The development of a mine, whether it is for diamonds or other metals, can produce substantial revenue, employment and supplier expenditures over an extended period of time, thus allowing the development of a longer term pool of skills in the community and allowing supplier industries to develop and mature. Preferential hiring, employment training and apprenticeship, and student summer employment for

northern and aboriginal peoples will result in a well-trained work force, which should be able to find continued employment after the mine has closed. The establishment of heritage funds, education programs and scholarships would promote higher education and training for future generations in the higher paying levels of the work force. In addition, preferential hiring of northern and aboriginal businesses for contract, sub-contract, and supplies and services would provide opportunities for new business development and expansion and possible new sources of export funds that could provide northern Alberta with long-term economic stability. The public needs to be aware of the potential for mineral exploration and development. There is also a need to resolve issues and barriers relating to development and to ensure responsible mineral development for the greatest benefit to all Northern Albertans.

The consultation process at the community level to provide background information on the mining sector and the potential impacts and benefits of developing mineral mines was well received. The process is viewed as ongoing as many small communities and individual native groups were not consulted during this first stage of the consultation process.

Most Northern Alberta groups consulted welcome the opportunity to participate in a developing mining sector. Their concern for the environmental impact of one or two mining developments in our lifetime is far outweighed by the potential future economic benefits. Most of the groups expressed a number of concerns including the following:

- Government and industry support for increased residency in Northern Communities, particularly during a mining development, including but not limited to people, jobs and infrastructure.
- Training and education is viewed as paramount to participating, although strong concern was voiced about initiating such programs prior to the real need for the workforce.
- Government support in evaluating areas of high to low mineral potential across all of Northern Alberta in order to make educated and informed decisions when Northern Communities are asked to give their blessing to sterilization of lands under programs such as Special Places 2000.
- Most communities wanted to know what they could do to encourage the development of the mining sector as well as participate in it. Web based lists of subcontractors, 1 to 3 day prospecting courses and support for government geoscience initiatives were most often mentioned for communities to participate in or support.
- Communication and further consultation by both government and industry through all stages of exploration, including early exploration prior to any major developments is perceived as important and provides for a good atmosphere of respect and understanding between the local northern community and industry and government.

Some recommendations for the future advancement of non-energy mineral mines and exploration in Northern Alberta are identified below. This list reflects the topics most discussed during the consultation process but it does not reflect all the possible solutions to some of the barriers that exist preventing mining from becoming a future reality in Northern Alberta. These recommendations are not in any order of importance.

Formation of a Mineral and Land Use Geoscience Initiative for Northern Alberta

- The initiative could focus on support and ongoing participation in the Evaluation of Mineral Potential and Land Use for Northern Alberta. This may include representatives from NADC,

AGS, Chamber of Resources, First Nations, Treaty 8, Metis Nation, Industry, Community Representatives and other interested parties. A Geoscience Committee could aid in developing a strategy to assess the mineral potential of Northern Alberta in order to provide Northern Albertans with the needed information and awareness of the mineral potential to aid in all future land use discussions and initiatives. This committee could aid the mining sector in providing a voice at round table discussions that address land use and land classification processes that may result in the sterilization of lands from future development.

Training Initiatives

- Several communities expressed strong interest in commencing 1 to 3 day prospecting courses as soon as possible. With time such an initiative could develop into longer summer courses that could be held at many of the Northern Regional Colleges such as Grande Prairie, Fairview, Athabasca etc. In the longer term expansion and demand could result in college courses for mine training in various trades. This has been an initiative in the NWT with new courses added at Arctic Colleges for employees at the northern diamond mines. Many of the trades currently needed at the oil sands operations in the Fort MacKay area would be applicable to the Non-Energy mining Sector.

Prospecting Assistance Grants

- In jurisdictions such as BC, ON and the NWT prospecting assistance grants are awarded to selected individuals on approved projects to assist in covering such costs as fieldwork and analytical costs. This should be evaluated for northern Albertans.

Mineral Exploration Incentive Programs

- Manitoba is currently in its fourth or fifth year of providing cash back as a percentage of exploration conducted and dollars spent particularly for remote locations in order to aid in offsetting expensive fuel and infrastructure costs. This program for Northeastern Manitoba has supported significant diamond exploration and staking that will likely culminate with the discovery of a new kimberlite field in the near future; (b) The availability of Flow-Through Funds for mineral exploration in Canada. In addition to the 15% added flow through incentive added by the Federal Finance Minister in October 2000, many provinces have added additional deductions that encourage investment funds to be spent and invested in their province. This added tax benefit was implemented after lobby by the Prospectors and Developers Association of Canada (PDAC) and the mining industry. Alberta could investigate such additional incentives for Alberta exploration and Alberta investors.

Mineral Potential Maps For Northern Alberta

- Preparation of these maps is considered essential for northern communities and aboriginal groups in order to make informed decisions with respect to future sterilization of lands. To prepare these types of maps will require increased government and industry funding for geoscience and mineral deposit information as well as some funds spent on technology. Government and joint government-industry initiatives should be looked at to increase funds.

Communication

- Encourage industry to consult and communicate with local communities and aboriginal groups especially during early stages of exploration. Perhaps once companies start to initiate drilling programs they should be encouraged but not required to consult with the local communities.

Education in Public School System

- The PDAC currently offers "The Mining Show" which is a travelling road show exhibit that promotes mining. This is being sent to remote communities across Canada. It could be possible to offer this exhibit or one with a similar theme. The Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA) could be partner in this effort due to their current programs in the public school system in Alberta.

Web-based Community and Sub-contractor Information

- There are many local communities with excellent web pages that are easy to access and have extensive lists of local businesses and sub-contractors. However, there are as many northern communities, particularly aboriginal communities that have neither web pages nor easily accessible lists of businesses, suppliers and subcontractors. The mining sector explores with much less funding then the oil and gas sector and as a consequence tends to employ small owner operator contractors and businesses in the nearby local communities. Easy access to names of small businesses will generate contracts for northern businesses today during early exploration and during a very difficult mining sector. Think what it will do once the mining sector starts to recover.

Continued Consultation

- The consultation process of visiting northern communities is considered an ongoing activity and should be continued in some fashion to increase awareness and bring the information in to many of the smaller communities and to the smaller native groups who could not be consulted within the scope and budget of this phase of the process.

1. Introduction

Northern Alberta has seen more mineral exploration for precious metals, base metals and diamonds in the last 5 years than in the previous 30 years across all of Alberta. This exploration industry has developed and started to flourish despite some of the most difficult times in recent memory for the mining sector as a whole. The mining sector requires large quantities of high risk capital to find and develop mines and the Canadian portion of the mining sector competes for that risk capital against the entire world.

Exploration for deposits of precious metals, base metals and diamonds is capital intensive and is truly comparable to searching for a 'needle in the haystack'. If industry is to spend large quantities of cash in search for deposits it must have large tracts of land to explore and be assured of land tenure. In addition, if an important deposit is found there must be safe land tenure and an understanding that mining will be allowed to proceed in an environmentally responsible manner. Mineral exploration has started to flourish in Northern Alberta over the last five years because of the following key points:

1) increasing awareness that Alberta has the potential to host deposits of precious metals, base metals and diamonds as a result of increased baseline scientific studies in combination with education and promotion,
2) recent regulatory changes, including modernization and streamlining of the mining regulations and land tenure system as well as land use policies by the Alberta Government,
3) recent discoveries of precious metals and diamonds in Northern Alberta by industry,
4) improvement of the basic geoscience database for Northern Alberta that encourages industry to explore, and lastly
5) promotion of the Alberta advantage for access, infrastructure, labour, expertise and a fair tax regime.

1.1 Background

There are many steps that the Provincial and local Municipal Governments have taken and can continue to take to encourage the exploration for and development of non-energy mineral mines. Alberta's 1999/2000 Throne Speech committed the Government to enhance the economic benefit of Alberta's Non-Energy resources for Albertans. These initiatives and the items listed above must continue to be supported in order to assist the mining and exploration industry in Northern Alberta to continue to flourish in the future.

Perhaps the best analogy to describe the potential economic impact of future mining in Northern Alberta is the discovery of diamonds in Lac de Gras, which has resulted in the development of the Ekati Mine, as well as the impact the two gold mines in Yellowknife have had on the City of Yellowknife. Large mine developments may occur only once or twice in a lifetime, however, local communities stand to reap huge benefits if even one economic diamond or gold mine can be found in Northern Alberta. The benefits to the local communities of Yellowknife and Fort McMurray of the respective mine developments at Lac de Gras and Fort MacKay region are enormous. In the case of a developing diamond or gold mine in Northern Alberta significant economic benefits would accrue to the many of the surrounding local communities and aboriginal groups.

Exploration for non-energy minerals yields few jobs during the early stages. Early exploration focuses on widespread regional areas and encompasses huge tracts of land. Surface sampling and airborne geophysical methods are the preferred exploration techniques, therefore, the impact on the environment during the early stages of exploration are also negligible. Advanced exploration once a discovery is made entails more land disturbance but typically this might occur at one or two highly prospective sites. The mining sector is renowned for its use of the small owner-operator during most if not all stages of exploration. Therefore, participation by local communities and native groups can and should occur at all stages of exploration through to development.

1.2 Terms of Reference

Alberta is well known for oil and gas development, however, the province also has the potential to develop a non-energy mineral sector. The development of this sector is still in its infancy and very speculative. Non-energy mineral exploration in Northern Alberta has increased over the past five years but the level of investment is well below its potential. APEX Geoscience Ltd. (APEX) was retained during the summer of 2000 as consultants by the Northern Alberta Development Council (NADC) to conduct a review of "*The potential for northern participation in the exploration and development of non-energy mineral mines in Northern Alberta*".

While the employment picture in the north as a whole is good, many small northern and aboriginal communities have high and chronic unemployment and underemployment. In some aboriginal communities unemployment is over 80%. Local economic benefits, environment and aboriginal land issues are currently hotly debated and controversial issues in northern Alberta. As a result, the NADC felt that the public needed to be educated on the impacts of a newly developing non-energy mining sector and the potential for northern Albertans to participate in the future development of this sector. There is an opportunity and a need to identify and resolve issues and barriers relating to development of the mining sector prior to an actual mining development. This study is intended to lay the groundwork for a proactive program to identify and resolve issues and barriers in order to ensure responsible mineral development for the greatest benefit to all Northern Albertans.

This project was primarily designed with a focus on non-energy mineral exploration and development within the NADC region. The target audience included organizations based within the NADC region such as: most northern communities, aboriginal and Metis organizations and communities, colleges, Chambers of Commerce and other economic development groups. The project was designed to provide an analysis of the northern non-energy mineral industry including but not limited to:

- the issues affecting the northern non-energy mineral sector;
- potential benefits to local and regional communities, industry and business and other northern organizations;
- opportunities for further development for value-added process and good neighbor policies between industry and communities;
- approaches taken in the non-energy mining sector in other jurisdictions regarding land-use, regulations, planning, integration to other sectors, and local and regional benefits;

- identify potential northern interest groups;
- prepare an initial background report and presentation for the Clients;
- conduct community based consultation; and
- prepare a final report that presents the findings and recommendations arising from the project

These and other key issues/concerns raised by northern communities include: lack of information about the opportunities; desire to maximize northern benefits; need to identify and address barriers to development; manpower requirements and required qualifications for employment; youth, education and training opportunities; social impact on communities and the region; what constitutes a good corporate company; and environment and aboriginal land issues.

As a result, APEX was retained to: (1) develop an overview report (including presentation documents and a PowerPoint slide presentation) on the impact of and the potential for northern participation in the Non-Energy mining sector including but not limited to the risks and rewards of mining, the potential impact on land usage and in future land use planning, the potential future benefits of a successful mine or mines and the benefits accrued even during the exploration stages to all local stakeholders including First Nations, Metis Settlements and Northern Communities, (2) complete a consultation process that involves meeting with Northern Community Mayors and Associations, Metis Settlements Leaders, Treaty 8 Regional Council Leaders and the Metis Nation Zone Representatives, (3) present the findings at a symposium to educate aboriginal groups, northern communities and associations in the NADC region, and (4) present the key findings of the consultation process and symposium in a final report.

2. Overview of the Mining Sector

2.1 *The Mineral Industry in Canada*

The total value of all mineral commodities produced in Canada increased in 1999 by 20.6% to an estimated $53.5 billion (Table 1). The value of mineral production, excluding the fuels group was $17 billion (includes coal). The value of the nonmetals group, which includes potash, diamonds, asbestos, salt, peat and sulphur, rose by 17% in 1999 to over $4 billion. The value for structural materials, comprising clay products, sand and gravel, stone, cement and lime surpassed $3.2 billion. In 1997, Canada ranked amongst the world's top five producers for some 19 mineral commodities including the number one for potash and uranium.

In 1998, the mineral industry contributed some $27.7 billion to Canada's total GDP that translates to 3.7% of Canada's total GDP. In 1999 there were 277 metal and non-metal mines in Canada; 3,000 sand, quarry and gravel operations; 54 nonferrous smelters, refineries and iron plants. Canada is the world leader in mining technology; Canadian companies have captured 70% of the world market share for airborne geophysical equipment. Less than 0.03% (0.40 million ha) of Canada's landmass (1.01 billion ha) has been used by mining activities over the last 150 years.

Employment in the mineral industry in 1999 totaled 386,000, and 2.6% of total Canadian employment in more than 150 communities. Canada is the source of mining and mineral expertise in many related domains such as Equity Financing (Canada provided for 61% of the worldwide market in 1998).

2.2 *The Mineral Exploration Industry in Canada*

World exploration expenditures fell in 1999 due to low metal prices but Canada remained in second place. Exploration and deposit appraisal expenditures totaled $501 Million, down 24% from the 1998 total of $656 million, a further 29% decline from 1997 (Table 2). Lower spending is expected to continue but expenditures in the search for diamonds are expected to increase. Explorers spent $126 million searching for diamonds in 1999 and this figure is expected to increase to $161 million in 2000. The Northwest Territories, Quebec and Ontario together accounted for 60% of Canada's exploration for the years 1998 to 2000.

2.3 *Mineral Exploration and Production in Alberta*

Alberta's mineral production is wholly derived from the non-metal sectors. Based on data presented in the Canada Minerals Yearbook 1999, mineral production in Alberta came primarily from industrial minerals. In 1998 Alberta ranked 5th in Canada for mineral production totaling 1,035 billion dollars (Table 2) including coal, sand and gravel, salt, quartz, stone, peat and sulphur.

As of January 1, 1999 Alberta had the following producing mines: 4 peat, 1 salt, 2 non-metals, 56 sand and gravel, 1 stone, 12 coal and 2 synthetic crude oil. Alberta produces 50% of the coal mined in Canada; the province of Alberta relies on coal for 80% of electrical power. Exploration in Alberta accounted for 3.5% ($17.5 Million) of Canada's total ($502.1 Million), ranking Alberta as 9th in Canada.

During 1997 in excess of 37 million hectares were staked in Industrial and Metallic Mineral Permits in order to explore for Non-Energy minerals in Alberta (Table 3). This amounted to much of the available lands in the province. This boom was brought upon by the discovery of diamonds in kimberlites in the Buffalo Head Hills area. In 1999 the work since the 1997 staking rush was submitted and totaled in excess of 25 million dollars. Since this initial rush, in 1999 permit applications dropped to 490 covering 3.8 million hectares (Table 4).

Minerals are known throughout the province of Alberta. A 1994, a reconnaissance metallogenic study by the Alberta Geological Survey documented in excess of 630 reported mineral, geological, geochemical or geophysical anomalies in Alberta (Olson *et al.*, 1994). Geological potential exists in Alberta for exploration and the discovery of the following non-energy mineral commodities as well as many more: Gemstones i.e.: Diamonds, Precious Metals: i.e.: Gold and Platinum, Base Metals i.e.: copper, zinc, nickel, lead and uranium, Iron, Industrial Minerals i.e.: sand, gravel, clay, bentonite, building stone, Limestone, Peat, Quartz, Paleoplacer deposits, Heavy Mineral Sands, Placer gold, Oil sands by-products i.e.: vanadium, gold, and platinum group elements (Figure 1).

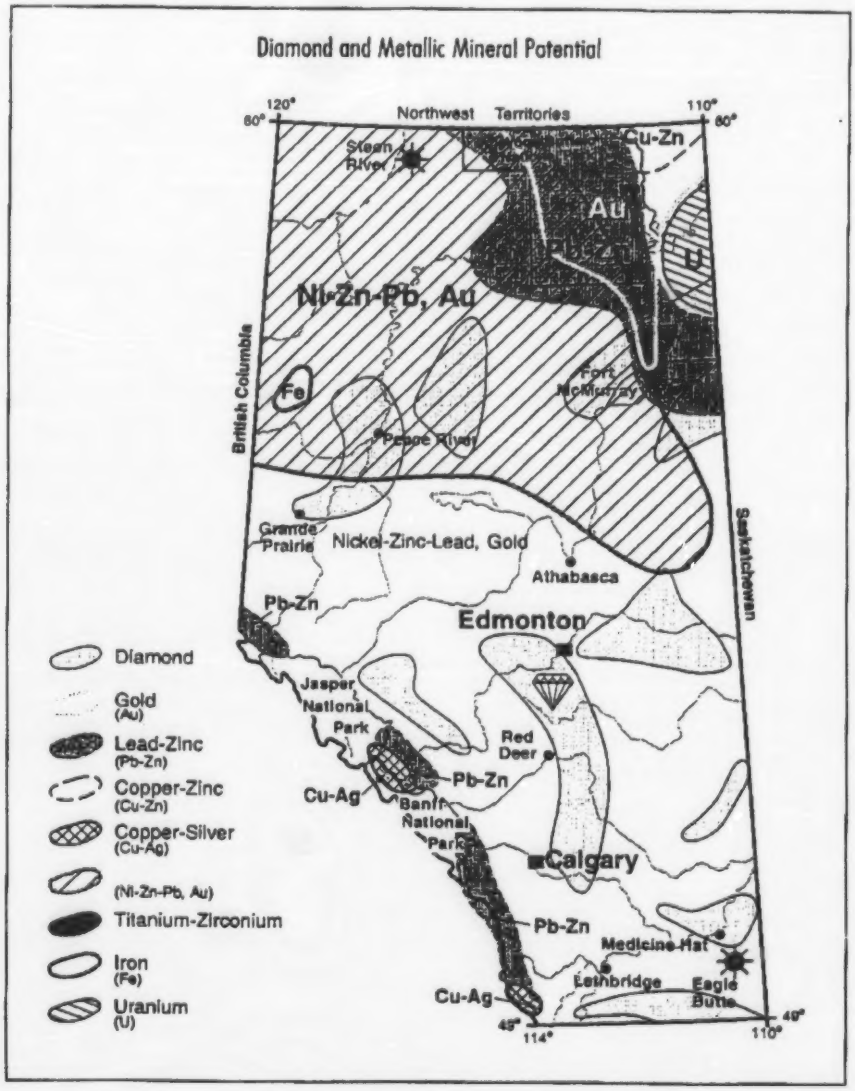

Figure 1: Illustration of Alberta's Non-Energy Mineral Potential, 1998 (AGS)

2.3 History of Mineral Rights and Minerals Legislation in Alberta

- The Provincial Crown controls approximately 75% of the metallic and industrial mineral rights in Alberta. Access to these packages of land must be leased for exploration or development from Alberta Resource Development and the "Mines and Minerals Act".
- Prospecting for metallic and industrial minerals on land where the Provincial Crown holds the subsurface rights is permitted without any license, permit, or regulatory approval, where the exploration occurs without surface disturbance. Although unoccupied public lands may be explored without restriction if no surface disturbance occurs, prospectors must receive prior consent from the surface owner for privately held land.

- If mechanized exploration equipment is to be used and/or the surface land disturbed, appropriate land use approvals and permits must be obtained such as an Exploration Licence, Exploration Permit and Exploration Approval.
- For an individual or company to secure the rights to any metallic or industrial minerals on lands where the Provincial Crown holds the subsurface rights, the individual or company must apply to obtain a "Metallic and Industrial Minerals Permit" for the desired location, equivalent to a 'mineral claim' in other jurisdictions in Canada. This does not require physical staking on the ground, but instead is acquired by making an application to Alberta Energy with the appropriate fee of $500 plus GST. The area for a mineral permit can range from a minimum of 16 ha to a maximum of 9,216 ha (one township).
- Exploration and resulting allowable assessment expenditures must be performed on a biannual basis in order to maintain the mineral permit in good standing. During the first biannual period, a total of $5 per hectare must be spent on exploration in order to maintain the permit in good standing and move it into the second biannual period. This escalates to $10 per hectare during the second period and $15 per hectare during the third biannual period. The assessment work and report is kept confidential for one year, afterwards it is kept in an open file at the Alberta Geological Survey for public viewing.
- For Metis Settlement or First Nations Lands, the Surface rights are owned by the individual Settlements. Therefore, any surface access tax or land use fees accrue to the Settlements and can be determined and negotiated by the Settlements.
- Each Metis Settlement could lobby the government to open the lands for ground acquisition by the general public only with consent of the individual Settlement. Each Settlement could conceivably strongly influence who acquires the Subsurface Metallic and Industrial Mineral Rights. As with the oil and gas rights, the Settlements are in a position that they could negotiate a very favorable agreement or agreements with one or more junior or senior mining companies to explore the Settlement Lands.
- Before mine development, authorization must be obtained from the Lieutenant Governor in Council and involves a number of detailed steps including the environment.

3. Economic Implication of Finding and Developing aNorthern Alberta Mine

3.1 The Diamond Sector

Introduction to Diamond Exploration

The existence of diamondiferous kimberlite pipes in the Northwest Territories (NT), Saskatchewan and Ontario has long indicated that potential exists for diamondiferous kimberlite pipes in Alberta. Areas underlain by Precambrian basement rocks, such as most of Alberta, are regarded as having the highest possible potential for the discovery of diamondiferous kimberlite pipes or diatremes.

Recent Diamond Exploration in Canada

Outside Alberta

Major diamond-bearing kimberlite and lamproite pipes occur in Archean cratons and Proterozoic mobile belts in South Africa, Russia and Australia. Canada contains abundant rocks of similar geological setting and age, but the existence of an important diamond deposit in this country has only recently been proven.

Prior to 1991, diamond exploration in Canada had been limited and mostly unsuccessful. The few kimberlite pipes that had been discovered were generally estimated to contain uneconomical grades of diamond. During 1991, Dia Met Minerals Ltd. announced the discovery of diamond-bearing kimberlite near Lac de Gras in the NT. This prompted one of the largest staking rushes in world history (Northwest Territories Government, 1993). To date, more than 250 kimberlite pipes have been discovered in the Lac de Gras region, of which more than 100 are believed to be diamondiferous (Armstrong, *pers. comm.*, 1998). The EKATI Mine owned by BHP-Dia Met-Chuck Fipke and Stu Blusson began production in October 1998.

The Keewatin District of the Nunavut Territory has yielded diamond occurrences in a lamproite near Dubawnt Lake indicating that potential exists for the discovery of diamondiferous diatremes in the Churchill Structural Province. The province of Alberta is predominantly underlain by basement that is part of the Churchill Structural Province.

In 1988, a diamond-bearing kimberlite pipe was discovered near Prince Albert, Saskatchewan. A total of 72 kimberlites have been discovered in the Fort a la Come area to date. The economics and the exploration for a viable diamond mine in the Fort a la Corne area has been severely hampered by the presence of think overburden covering each kimberlite.

In eastern Canada, diamondiferous kimberlites have been discovered in the James Bay area, near Kirkland Lake, the Wawa area as well as the Tourngat Mountains of Labrador. Although diamond exploration in British Columbia (BC) has not been as extensive as elsewhere in Canada, the discovery of diamondiferous lamprophyres and/or lamproites near Golden, BC is significant to Alberta exploration because many of these pipes straddle the BC - Alberta border.

Within Alberta

The first clue to the presence of possible diamond-bearing source rocks in Alberta was the discovery of a perfect octahedral diamond, estimated at about 1 carat in weight, by farm worker Emar Opdahl during 1958 in the Evansburg area of west-central Alberta (Edmonton Journal, 1992a). The first well-documented diamond discovery in Alberta occurred in 1992 when a prospector, Tom Bryant, found two microdiamonds, weighing 0.14 and 0.17 carats in recent stream sediments at Etzikom Coulee, near Legend in southern Alberta (Edmonton Journal, 1992b; Morton *et al.*, 1993; Takla Star Resources Ltd., 1993a, b). One beige-green diamond chip was taken from the Black Butte diatreme, an intrusion of lamproitic affinity, located about 150 km east-southeast of Lethbridge.

Diamonds are also reported to have been discovered in gravels of the North Saskatchewan River and associated tributary creeks east of Edmonton (Bryant, *pers. comm.*, 1993; Morton *et al., 1993),* and in

Cretaceous-Tertiary sediments along the Red Deer River in central Alberta (Science City News, 1992).

During 1995, two important announcements were made in Alberta: Monopros Limited confirmed a kimberlite located about 75-km northeast of Grande Prairie. (Wood and Williams, *1994).* The second was that 23 diamonds were recovered from streams north of Hinton in west central Alberta (Corporate Press Releases). The source for the diamonds has not been found to date.

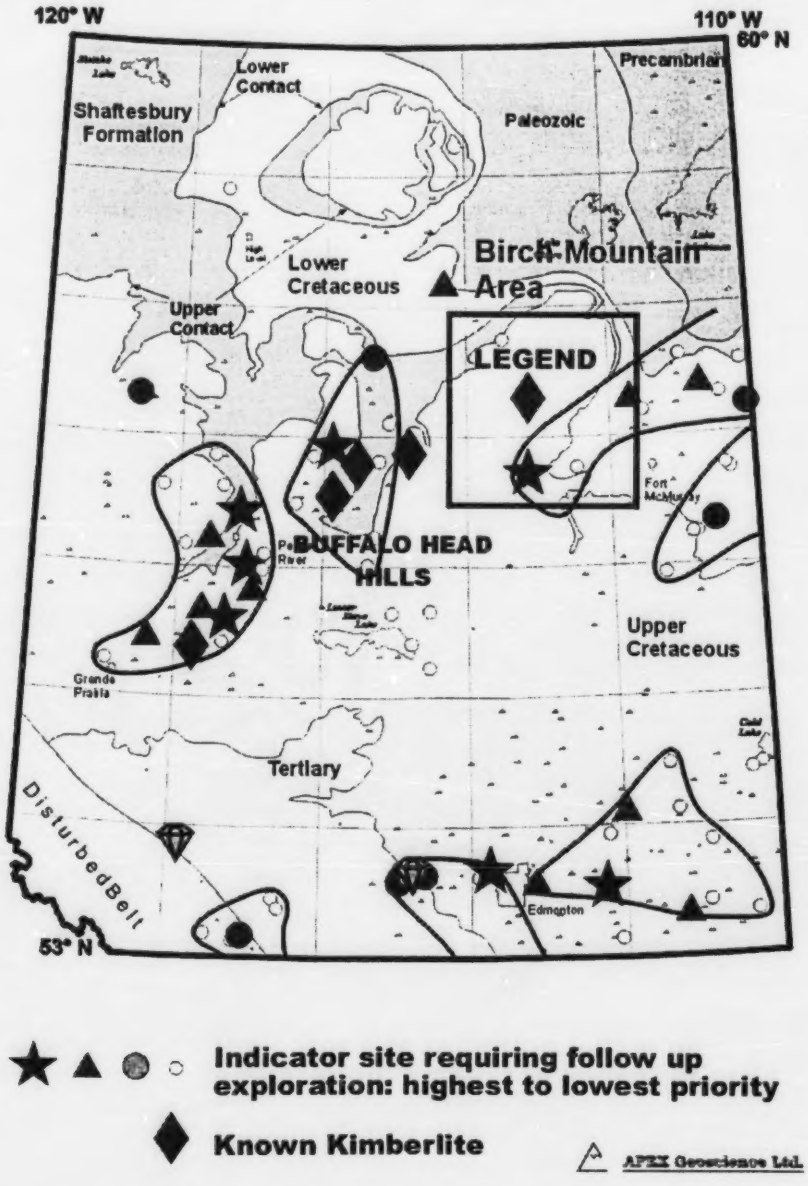

Figure 2 Kimberlite Indicator Minerals in Northern Alberta

The most significant announcement to date for diamond exploration in Alberta occurred on January 27, 1997, when Ashton announced that the first two of ten drillholes intersected kimberlite in the Buffalo Head Hills. Since, exploration by Ashton has resulted in the discovery of 35 kimberlite pipes, of which at least 23 are reported to be diamondiferous. Several of the diamondiferous pipes have yielded diamond counts that are highly encouraging and indicate that this new kimberlite province has the potential to yield an economic pipe. In late 1998 Montello in a joint venture with Kennecott announced the discovery of eight kimberlites in the Birch Mountains on the Legend Property. In November 2000, New Blue Ribbon Resources Ltd announced the discovery of an additional kimberlite at the Legend Property, thus bringing the total to nine kimberlites (Figure 2).

In summary, recent exploration in Alberta has been successful in discovering at least 45 kimberlite pipes, several diamond occurrences, favorable diamond indicator minerals, and in identifying abundant geophysical anomalies which may represent kimberlite or lamproite pipes or dykes. Extensive exploration over the next ten years will likely yield the discovery of many more diamondiferous kimberlites in Alberta. During this period, Northern Alberta will likely see at least tens of millions of dollars up to hundreds of millions of dollars spent in exploration for new pipes and in assessing the potential of the existing pipes to host a viable diamond mine.

The Ekati Diamond Mine, Northwest Territories

BHP Diamonds Inc. opened the first Canadian diamond mine. The Ekati mine is located near Lac de Gras about 300km northeast of Yellowknife in the Northwest Territories. The mine is expected to produce 3.5 to 4.5 million carats per year and this will account for 4% of global diamond production by weight and 6% by value. 1999 was the first full year of production for the Ekati diamond mine where 2.4 million carats worth $581.7 million.

To date, more than two billion dollars has been spent on the early to advanced stages of exploration (including environmental assessment) for diamonds with an additional one billion dollars spent on advanced development at the Ekati Mine and the bordering Diavik Site (Canada's second diamond mine). A conservative estimate for the total revenue generated by both Ekati and Diavik is likely 25 billion dollars over the next 15 years and perhaps as high as 50 billion dollars over their lifespan of 25 years. Ekati added an estimated $6.2 billion to the NWT economy in 1997 (Hancock, Mining North 1997).

The Ekati diamond mine has signed impact and benefit agreements with three separate aboriginal groups and other agreements are under negotiation. More than 80% of their work force are Northern of which 50% are Aboriginal. The remaining workforce and most of the subcontractors are all preferentially hired out of local communities such as Yellowknife, Rae-Edzo and Coppermine even though these communities are hundreds of kilometres away. In 1999 a total of 558 people worked at Ekati of which 270 chose to live in Yellowknife (City of Yellowknife 1999 Annual Report). For example, the NT diamond industry has estimated approximately 1,220 person-years of employment in just the construction phase of the Ekati Project. The initial operation phase will have 640 employees, increasing to an average of 830 over the 25-year mine life (20,800 person-years).

Throughout the construction phase, BHP met commitments to maximize both northern purchases and northern hire. Ekati uses Yellowknife as a staging point. During construction 28% of the total annual

value of Goods and Services was purchased from local businesses. In 1996 this target was exceeded by 37%; of these purchases 42% were bought from aboriginal businesses. The target for 1998 was 70% purchased from northern businesses (Hancock, Mining North 1997). Footprint of the mine site is minimal: all infrastructure totals less than 11 square kilometres (Hancock, Mining North 1997).

The Secondary Diamond Industry in Canada

Impacts are being seen throughout the country, as Canada becomes the third largest diamond country in the world. Employment in secondary services can add significantly to a country or province economy. Secondary Diamond services developed in Yellowknife to handle diamond production from the Ekati mine have resulted to date in 120 direct and 27 indirect jobs amounting to over $4 Million in income plus additional items such as housing, food and others that filter into the Yellowknife economy (1999 Annual Report, City of Yellowknife). Sample facilities include diamond valuator facilities, diamond cutting and polishing, and training. Elsewhere in Canada, related jobs have been newly created such as in the tools and manufacturing industry and diamond jewelry manufacturing industry.

3.2 *The Gold Sector*

Introduction to Gold Production and Exploration

The existence of gold deposits in the Northwest Territories, Saskatchewan, Manitoba, Ontario, Quebec and British Columbia have long indicated that potential exists for gold deposits to be located in Alberta. Areas with exposed Precambrian basement rocks, such as in northeast Alberta, are regarded as having the highest potential for such a discovery. Exploration for and production of gold is relative to the gold price; with declining prices over the past five years, exploration and production has been reduced. Primarily major mining companies are exploring only a select number of high-grade gold deposits.

Gold Production in Canada

Canada is the world's fourth largest gold producer in the world behind South Africa, the United States and Australia (Natural Resources Canada, 1998). In 1998 Canada produced 166.1 tonnes of gold and the value of Canada's gold shipments totaled $2.3 Billion. There were 40 primary gold producers in Canada by the end of 1998. Employment in primary gold mines totaled 9,565 declining from the peak of 12,631 in 1989. The revenues generated by gold operation are a harsh contrast to those generated by diamond mines. However, the long term impacts and benefits associated with gold mining can still be substantial.

Recent Gold Exploration in Canada

Outside Alberta

In 1996 in the Northwest and Nunavut Territories, exploration for gold was performed at more than 30 separate projects and totaled more than $47 million in expenditures; in contrast in 1995 more than 72 gold exploration projects were active (DIAND Exploration Overview 1995, 1996).

During 1999, exploration operated by WMC International at the Meliadine West Property, Nunavut Territory totaled seven million dollars. A resource of over 6 million ounces of gold is delineated with intersections of 14.64 g Au/t over 8.55 m and 54.91 g Au/t over 2.92 m (Sharp, 1999). Also in the

Nunavut Territory, Miramar Mining Corporation and Hope Bay Gold Corporation continue to explore the surface and underground at the Boston Gold Deposit. This property was purchased for $23 million and was previously estimated to contain an overall inferred resource of 4.2 million ounces of gold. Example intersections include 229 g Au/t over 3.0 metres and 27.3 g At/t over 8.6 metres (corporate press releases). In northwest Ontario, exploration by GoldCorp Inc. continues to expand a new high-grade gold zone at the Red Lake Mine where grades reach as high as 1,127 oz/t Au. The Red Lake Mine has historic production of more than 3 million ounces of gold since 1948 and represents an example of what new geological ideas and technological advances can achieve (corporate press releases).

Within Alberta

Placer gold was discovered in workable quantities along the North Saskatchewan River in 1861 and potentially workable quantities along the Peace River in 1890. Between 1908 and 1915 more than 15,000 ounces of gold was recovered from the North Saskatchewan River. Many other rivers in Alberta have yielded concentrations of placer gold including the McLeod River and upland gravel deposits such as the Grimshaw gravel deposits where placer gold is recovered during the gravel extraction, thus providing the operation with increased profits.

Numerous parties have reported gold in the Precambrian basement rocks in northeast Alberta. Southwest of the Precambrian, many companies including Focal Resources Ltd., Tintina Mines Ltd. and Birch Mountain Resources Ltd. have reported anomalous amounts of gold and platinum group elements from Devonian limestone and Cretaceous black shells of northeast Alberta. Concentrations approaching economic threshold grades have been reported, however, no resources have been identified to date. Several gold occurrences have been poorly documented in the Alberta Rocky Mountains and Foothills. Perhaps the most famous is the Lost Lemon Gold Mine which was reported in 1870 by prospectors near Crowsnest Pass (Olson *et al.*, 1994). The location of this site has never been confirmed.

The Yellowknife Experience: An Example of a City Founded on Gold Mining

Mining has been key to the evolving economy of the Northwest Territories and increasing self-reliance. Many key developments to infrastructure in the NT were a direct result of mining operations (Mining Journal, 1995) such as the first hydroelectric power plant, the railway and ice road technology. The MacKenzie Highway was built to reach the gold mining town of Yellowknife well before it became the center for government. In 1967 Yellowknife became the capital of the NT and currently has a population in excess of 17,275 (1996 Census)(NT Legislative Assembly Website).

Gold production commenced at the site of the present day City of Yellowknife in 1938. At times Yellowknife supported up to six gold mines, both in town and at remote sites. The Giant Gold Mine produced over 7.0 Million ounces of gold from 1948-1998 with revenues of $2.3 Billion. An average year employed 300 workers; since 1948 this equates to 17,500 person years of employment. As a result of the Giant Mine in the Yellowknife area, capital expenditures totaled $272 Million; exploration expenditures totaled $28 Million. From 1938-1998, the second gold mine in Yellowknife, the Con Gold Mine, produced over 4.9 Million ounces of gold and 327,795 kg of silver (DIAND). In 1995 1,437 workers were employed directly in mining at six projects (DIAND, 1995).

In 1992 NT mineral production accounted for 75% of the Goods and Services (valued at $207 Million) in the NT and over 25% of the GDP (Mining Journal 1993). Of these goods and services ***only*** 17% was spent in the NT and the remainder to southern-based businesses. As a result of this, certain incentives were introduced such as the Payroll Tax, Northern Housing Allowances, and a 3-year Royalty-free holiday for opening mines. These incentives still did not fully address the problem.

Closure of mines has a direct impact on revenues. Gold production in 1997 was 14,110 kilograms valued at $207,968,000; In 1998 3,845 kilograms gold was produced valued at $53,771,000 (Natural Resources Canada, 1998). A total of 900 direct jobs were lost in the NT as a result of the closure of two mines and additional layoffs. High operating costs (due to high wages, high transportation and energy costs) and the low price of gold caused these results.

3.3 *The Economic Risks and Benefits of a Possible Mine in Northern Alberta*
The Diamond Sector

Approximately 6,000 kimberlite pipes, the primary source of gem quality diamonds other than placer deposits secondarily derived from erosion of kimberlite pipes, have been found in the world to date since the first discovery of diamonds in a kimberlite in 1870 in South Africa. Less than 10% of the kimberlite pipes found around the world to date have yielded diamonds. Less than 1% of the kimberlites found to date are or were sufficiently diamondiferous to be viably economic to initiate mining. Fewer than 50 kimberlite pipes in the world are considered to be commercial, and of these, only about 15 are considered major producers (Jennings, 1990).

More than 250 kimberlite pipes have been found in the NT. Roughly 40% of the NT pipes discovered to date have yielded diamonds, an unusually high percentage by world standards. At least nine kimberlite pipes are currently the focus of advanced feasibility studies that will see projects advance to production. It is likely that more than 20 kimberlite pipes will eventually be mined for gem quality diamonds over the next 25 years. These numbers indicate that close to 10% of the pipes discovered to date in the NT will be commercial, which is almost an order of magnitude greater than world averages. Even with this fantastic level of success, it has taken BHP Diamonds Ltd. five years and the expenditure of $256 million from the discovery of the Point Lake kimberlite pipe in the fall of 1991 to final approval for mining of the Ekati project in November 1996. It is anticipated that the Ekati project will yield a minimum mining life of 25 years and generate total net revenue of about $6.2 billion in 1998 dollars.

In Alberta, several junior mining companies are actively exploring for diamonds, particularly on and proximal to the Buffalo Head Hills. Of the 35 kimberlite pipes found to date on Ashton's Buffalo Head Hills Property, 23 are diamondiferous, yielding initial diamond counts encouraging enough to warrant mini-bulk sampling with further results pending. A great deal of additional exploration and sampling on the known Buffalo Head Hills pipes and many untested targets (80+) within the 1.45 million acres property remain. Expenditures for 1998 exploration programs are expected to range between $5 million to $10 million. Exploration will likely be drawn out longer in Alberta than in the NT because: (a) the complex Quaternary history and the thickness of overburden, (b) the paucity of diamond and kimberlite indicator mineral sampling, and (c) because there is some suspicion that the chemistry of the pipes and their contained diamond indicator minerals is not traditional compared with known kimberlites found elsewhere. As a, result, the exploration industry has been forced to go to techniques such as geophysics

designed to look for hidden pipes beneath significant depths of overburden. In addition, it will also mean that most if not all of the kimberlite pipes discovered in Alberta will have to be drill tested in order to get enough diamond indicator minerals and/or diamonds to assess their potential to host a significant diamond deposit. It will likely be several years, if then, before an economic diamond pipe is confirmed. However, based on world statistics, the potential is high that Ashton's property will yield a diamond mine given enough exploration expenditures and time.

The Gold Sector

Approximately 40 primary gold mines were operating in Canada in 1998. During 1998 three gold mines opened and two closed (NRCan 1998). To date more than 900 gold showings are known in the Slave Geological Province; from these more than 250 have been drill-tested/advance exploration; of these only 22 have ever been mined. Of these 22 mines, 95% of all the gold produced in the Slave Structural Province has been from four mines (Con, Giant, Lupin and Discovery). (NORMIN Database Search, DIAND). Based on these statistics, only 2% of all gold showings are ever mined in the NWT. Note that this is a region where most deposits are remote and access is difficult and costly. In other jurisdictions this percentage should be higher.

3.4 Economic Implications of Exploring for and Developing a Mine in Northern Alberta

As a result of one mine opening, employment, purchasing and revenue streams to the region may be spread over 15+ years of operation, thus allowing the development of a longer term pool of skills in the community and allowing supplier industries to develop and mature, providing the Metis Settlements, First Nations and Northern Communities with long-term economic stability through:

- Revenue Generation.
- Employment: Preferential hiring, employment training and apprenticeship and student summer employment for Aboriginal and Local peoples. The result will be a well-trained work force that should be able to find continued employment after the mine has closed. Local personnel hired for employment in the mining sector will depend on availability of skilled labor; amount of work subcontracted to local companies; hiring centers established for construction employment; and hiring directives issued in tender calls to major contractors. During mine construction and development, direct employment and income will result from jobs at the mine. Indirect employment and income will result from jobs created as a result of project purchases of goods and services. Induced employment and income will result from the re-spending of people directly employed by the mine and indirectly employed by suppliers to the mine.
- Education and Skill Levels: increasing the education and skill level of the labor force by providing on the job training programs. Job training and certification programs increasing education and skill levels. Scholarship programs for students. Student employment for seasonal work.
- Aboriginal Participation: in the exploration and development phases as well as the ongoing mining activities. In the NT this is being enhanced through cross cultural training workshops to share cultural concerns in a unique work environment, on site job training and certification programs, a relaxation of strict educational standards, scholarship programs for students and student employment for seasonal work. In addition, rotational work schedules are being developed to assist northern aboriginal people to maintain traditional activities concurrent with employment. Traditional knowledge could be

included in the overall project planning, including community meetings, personal interviews, site visits, discussions with employees, funding for research and land use maps to ensure that exploration programs and mine development is carried out with respect for the concerns of present and future generations.

- Impact and benefit agreements with aboriginal and northern groups. The establishment of heritage funds, education and scholarships would promote higher education and training for future generations in the higher paying levels of the workforce.
- Local subcontracts available such as survey and sampling services, temporary mechanical - electrical installations, water/power services, roadwork and architectural designs of the permanent camp.
- Local suppliers have had first chance at supplying required goods and services, if their prices are competitive and if they can meet quality requirements.
- Business Development and Expansion: In the NT aboriginal based businesses have been set up to provide services to the diamond industry. The most successful operations so far have been joint ventures between local businesses and local aboriginal groups. For example: Contract stripping at the Ekati project was being provided by Nuna Logistics, a 51% aboriginal owned company. The joint venture or shared ownership with existing firms to provide services to the diamond and mining industry is proving to be very successful because it brings together existing skilled labor in local businesses with local aboriginal groups that have largely unskilled labor.
- Social: the costs of increased social support systems due to infrastructure and public services could be offset by the reduction in welfare and unemployment costs. In addition, the contribution of millions of dollars annually in revenue from direct and indirect taxes, fees and royalties from a producing diamond mine could be used towards social programs such as drug and alcohol rehabilitation, family abuse and other community programs.
- Infrastructure Development

These types of long term goals and benefits do not only accrue on the basis of developing a successful diamond mine but they can also accrue as a result of extensive and advanced exploration. In the NT alone, more than two billion dollars has been spent in the last six years on exploration and development without any diamond production. Ashton has already reached the stage where they have collected a bulk sample from one of their kimberlite pipes in the Buffalo Head Hills. Ashton has spent more than $20 million dollars and has only conducted very preliminary sampling on 23 kimberlite pipes out of a total of likely more than 70 to 80 pipes. Ashton and its joint venture partners could conceivably spend more than $200 million before they are able to make a production decision or a decision to abandon the project.

The first diamondiferous kimberlite was found in South Africa in 1870. DeBeers Limited as well as other mining companies have extensively explored southern Africa for more than 100 years. Yet renewed exploration efforts in the last twenty years in South Africa and Botswana have resulted in the discovery and development of two or three extremely profitable diamond mines. The exploration for and development of diamond mines could be a sustainable long-term industry in Alberta that could provide many business opportunities for current and future generations in Northern Alberta.

4. Environmental Impact of Exploration, Development and Mining of a Deposit

Mining activities to some extent may cause habitat loss or alteration, interference with migration patterns, increased noise disturbance, hazards and altered ecology. Construction may reduce local food sources and

certain types of habitat. In the immediate development area, increased levels of human activity and noise may disturb wildlife and cause slightly higher levels of mortality through encounters with mine traffic There will be a need to monitor local populations, particularly vulnerable species to mitigate potential impacts. More importantly, hunting will be prohibited within the claim block due to safety regulations.

Mine development including lake de-watering, road construction, surface drainage control, tailings disposal and mine closure, will cause local impacts to the surface hydrology of the watershed including changes to drainage patterns, lake storage and stream flow. In the case of diamondiferous kimberlite pipes involved in a mine plan, lakes overlying kimberlitic pipes will have to be de-watered, which may result in a loss of aquatic habitat and fishing potential. In addition, changes to the watershed regime may result in potential draw down of adjacent lakes and streams to replenish the groundwater system.

Some mines such as diamond mines or even the early stages of gold and base metals mines are initiated as open-pit operations. Pre-stripping of the area will accompany de-watering procedures and open pit and underground mining. As a result, a considerable amount of surficial and bedrock material will be removed from the mining area. Upon mine closure, the entire area will need to be re-landscaped.

Various project activities may affect water quality within the immediate project area throughout all stages of mine development, particularly contamination resulting from surficial disturbance and management of impounded tailing water. Water quality will be affected by project related activities such as sedimentation caused by construction of dams, roads and development of surface facilities and diversion channels near watercourses and lakes. Exploration drilling may have a short term and localized impact on water quality, should be minimized by the use of flocculants to assist natural settling processes and recovering solids.

Degraded ambient air quality may be present in the pits during the operation phase due to basic mining activities and the incinerators. The dust generated from these procedures may increase total suspended solid concentrations in nearby lakes.

Noise disturbances caused by aircraft, mining equipment and blasting may be audible within 30 km of the operation. Waste generated on site will need to be recycled, treated or disposed of safely. An environmental development plan is needed to focus on the safe and permanent storage of process plant tailings and mined out pits; management and proper disposal of domestic and other waste; construction and operation of the project to minimize environmental disturbance; and the development of an appropriate site reclamation, decommissioning and closure plan.

The amount of land required in exploration can be extensive. Kimberlite pipes may range from 100m by 100m to 600m by 600m in size and clusters of pipes can exceed 10 km in length.

Although the local impact of a single mine can be significant, it should be kept in mind that Alberta would be extremely fortunate to see the development of more than one or two diamond or metal mines in our lifetime. The more land that is available in the early stages of exploration will increase the likelihood of finding the one or two deposits that could be economically mined for diamonds or other metals. The cumulative impact of mining in any jurisdiction should be minimal on the basis that the odds of developing more than one mine in any region are extremely remote.

5.0 The Consultation Process

As part of the education process, a 25 minute 50 slide PowerPoint presentation to be used for community consultation was constructed during late August to late September 2000 based upon a 34-page draft of the background information document. The PowerPoint presentation was designed to communicate background economic information and a limited amount of statistical data about the mining industry in Canada and Alberta. Background information on the discovery and development of diamond deposits in the NWT was used an example to illustrate the potential to find similar deposits in Alberta and some of the environmental and economic impacts exploration through to development could have on Northern Alberta. In addition, background information accompanied with examples of mineral exploration techniques right up to development were provided. During late September and early October meetings were set up with a number of northern communities, Metis Groups and First Nation Groups.

5.1 *Community Consultation*

Community consultation was initiated in early October and continued through until the wrap up symposium on December 11. A couple of meetings were also completed after the wrap up symposium during January and February 2001. In total, more than 20 northern communities and/or Metis or First Nations Groups were met with and consulted using the PowerPoint presentation. In addition, some communities and/or First Nations Groups were provided with the draft mining information document and were subsequently interviewed by phone or in Edmonton. In the case of the local communities, representation from the Town Council and each community's Chamber of Commerce was usually met with.

In general, the consultation process was initiated with the 25 minute PowerPoint presentation followed by a question and answer period of 30 minutes. The average consultation and presentation consisted of about 10 to 15 people and lasted an average of about 90 minutes.

5.2 Wrap Up Symposium

A wrap up symposium was conducted in Edmonton on December 11 and consisted of about 60 attendees. An excellent cross section of Government, Industry, Metis and First Nations representatives was achieved at the symposium. Presentations were made by Mr. M.B. Dufresne on "*The potential for northern participation in the exploration and development of non-energy mineral mines in Northern Alberta*", by Ms. B.A. MacKeen on *"Education and training requirements of the non-energy mineral sector"* and by Dr. R.A. Olson on *"The mineral potential of Northern Alberta and government geoscience initiatives in support of the non-energy mineral sector"*.

The symposium was held by the Northern Alberta Development Council in conjunction with the Provincial Department of Resource Development. The symposium culminated with the attendees breaking into small discussion groups to explore the reactions of the attendees and their perception of the main issues, barriers and opportunities that the mining sector might present to Northern Alberta.

5.3 Findings
Feedback from the Consultation Process

The consultation process, particularly the visits to the local communities was well received. In only a few cases were people, communities or native groups aware of the potential for non-energy mineral mines in Northern Alberta. It was well understood that no non-energy mineral mines were likely to be developed in the next 3 years and that it could take anywhere from 5 to 10 years or longer to see a single mining development. Most groups made the comment that mining may provide an excellent opportunity to be proactive with respect to the major issues and barriers prior to a development as opposed to being reactive as occurs with most major development projects. Most groups look forward to the opportunity to participate and they wondered what they might be able to do to prepare for that future opportunity.

There were a number of points and themes that almost all groups discussed, provided comments on or had concerns about. The following list depicts most of the major issues and concerns that were voiced. The list is not in any particular order of importance.

- Most communities expressed surprise that (a) there is strong mineral potential in Northern Alberta, and (b) that there is little known about it in the general public and even in the geological community. Correlative to that was that most people were surprised that the current publicly available geoscience database for Northern Alberta, particularly as it applies to mineral potential, is well below the standards in most other Canadian jurisdictions.
- In most cases there was a concern about further development causing added land use and environmental stress. However after hearing and seeing what typical mineral exploration involved and the likelihood that Northern Albertans would be lucky to see one or two major developments in our lifetime this concern was perceived to be minor.
- Many communities and native groups welcome the potential economic rewards that would be associated with a mining development as most groups expressed a concern about maintaining jobs and infrastructure in their regions over long periods of time. Most groups understood the impact and economic benefit to the local communities that would result from even one mining development. In particular, many of the agricultural based communities that have little economic benefit deriving from logging or oil and gas were extremely excited about the prospects that a potential mineral mining development could offer.
- Almost every northern group indicated that land use and, therefore, land use planning that incorporates at least a voice on behalf of mining is a critical element. Most were surprised to find out that there was mining potential in some areas and that this was never brought up during many of the hearings and consultations conducted for Special Areas 2000. Most people were of the mind that all potential land use opportunities should be discussed prior to locking land up on a permanent basis. A specific example that was talked about was the large Chinchaga Wildland Park Protected Area. APEX has since been asked to provide a voice for the mining sector in construction of this Final Management Plan for the area.
- A strong desire was expressed to have much of the land base of Northern Alberta evaluated for mineral mining potential. The main reason was that the communities feel pressured as they are often being forced to make decisions to review and approve sterilization of land in short time frames, such as with Special Areas 2000. If the mineral potential of the lands are at least

assessed in a preliminary way then the local communities could make informed decisions with respect to sterilization and that lands of high potential that could reap future economic benefits are not unknowingly removed from future land usage.

- Several groups were left with the impression that lands that have been specifically withdrawn and protected, particularly in the case of Special Areas 2000, could at some future point in time be reclassified so that certain limited resource activities could be looked at. However, the discussion that followed used the example of many of Alberta's Eastern Slope and Wilderness areas such as Willmore, Ghost River etc. In the case of each of the Wilderness areas, staking for minerals is not permitted but there is a provision in the regulations governing these areas that they could be opened up for limited land use if a discovery were ever made. In fact, mineral exploration is also permitted but without certainty of mineral rights and the removal of any form of access other than by horseback, industry has been precluded from actively exploring thereby effectively sterilizing the lands from future exploration and mining development. In addition, as time has progressed for many of these Wilderness Areas, the initial liberal access and exploration rules that were initially established have been removed adding to the effective sterilization of these lands. Most of the communities were in full agreement that their preference would be to have the best understanding of mineral potential for all lands of Northern Alberta prior to being forced into making land sterilization decisions. Most groups were made aware that assessing the mineral potential would require some kind of government expenditures on basic geoscience data and technology and that this was an acceptable price to pay for today when they are being asked to sterilize land for the future.
- Every community visited, now that they are aware that there is potential for a future mining sector in Alberta, will make sure that mining is represented at or at least offered the opportunity to be represented at any land use or land classification hearings or meetings.
- Many communities were excited about the possibility of a value added industry in the case of diamonds and the diamond cutting industry that has begun and is likely to flourish in Yellowknife. They wondered what could be done to enhance that specific opportunity.
- There were concerns raised about moving forward too quickly on some fronts, particularly with respect to training initiatives, prior to a mining development becoming a reality. The concerns raised were centered on training people and then not having the jobs they are trained for become a reality. The proverbial cart before the horse. This was particularly emphasized by most if not all of the native groups.
- An important comment made by most communities and native groups was that when industry comes to Northern Alberta even during early exploration that they are mindful and respectful of the Northerners, their communities and the surrounding environment because Northerners will have to live on that land the rest of their lives, long after industry has left. Ensuing discussions about what this means centered around adequate communication of ongoing programs in the local nearby communities wherever and whenever possible. More community consultation by industry, particularly during the early stages of exploration, would make life a lot easier for the local communities and the companies. This is a theme that the Government of the Northwest Territories and Nunavut are trying to encourage across the NWT and NT.
- Most communities asked what could they do to encourage exploration and perhaps aid in an economic discovery, as well as prepare for the opportunities that might arise. Several possibilities were discussed ranging from web based lists of contractors, to training initiatives, to government spending dollars on improving the very poor geoscience database, particularly where

the data would aid in assessing the mineral potential of the land, and on technology that might advance sub-economic resources to economic status such as the Clear Hills iron deposits.

- The native groups expressed a few more misgivings and concerns than most of the northern communities. Their concerns were often focussed around how can they participate, and in many cases a desire was expressed to participate wherever and whenever possible as an equity partner. The native groups expressed far more concern about the environmental impacts of a development than most of the established northern communities, in particular because they feel that they are working with a much smaller land base. In addition they were very concerned about more training programs that did not result in jobs at the end of the day.
- In many cases several of the native groups felt it was hard to focus on something so distant when they are struggling with present barriers such as adequate jobs and education, proper credit facilities to help them start businesses and own a home, adequate policing, etc.
- The native groups expressed a desire for industry to be very respectful of their way, their land and their traditions. Perhaps the most important aspect of this comment from the native groups is for industry and the native groups to have at their disposal adequate maps that describe and map out traditional lands and traditional use. In addition, community consultation and communication by industry even during the early stages of exploration is regarded as very important.
- From the perspective of training, almost everyone addressed found the topic of mineral exploration, particularly for diamonds and gold, very interesting. To that end, they found the analogy of the NWT experience with prospecting courses very important and worth immediately pursuing. Alberta armed with a number of properly educated prospectors, particularly amongst the native groups, could really enhance the prospects for the discovery an economic mineral deposit. Several communities thought that a short 2 to 3 day course in geology and prospecting conducted at the right time of year would be well received in most communities and could be done over a weekend etc. This type of initiative has been extremely successful in the NWT, particularly presenting these types of courses in each community. Other jurisdictions such as the Northwest Territories, British Columbia and Ontario sponsor prospecting grants to qualified prospectors and targets. This should be a consideration for Alberta.

Feedback from the Wrap Up Symposium

A summary of the issues, barriers and opportunities that were identified at the wrap up symposium is being prepared by the NADC. The major opportunities that were identified at the end of the discussion groups include the following:

- Economic growth and diversification away from the mainstays of the north including agriculture, the energy sector and logging.
- Training and increased potential for the development of a skilled labour force.
- Community growth including residency and infrastructure.

In terms of the major barriers to development of the mining sector:

- Government support to increase awareness and promote the benefits which include improving what ever needed to be improved to attract industry such as the regulatory environment and atmosphere, additional funds to improve the geoscience database and perhaps technology spending.

- Commitment of industry and government to residency in Northern Communities as the mining sector develops.
- Training programs so that Northern Albertans can take advantage of a developing mining sector.
- Continued and improved communication and consultation by government and industry during all phases of exploration and development of the sector.
- Awareness and responsibility with respect to the environmental impact.

6.0 Concluding Remarks and Recommendations

APEX was retained by the NADC during summer 2000 to develop an overview report (including presentation documents and a PowerPoint slide presentation) on the impact of and the potential for northern participation in the Non-Energy mining sector. The report and presentation introduced an overview of the mining sector and focused on the potential risks and rewards of mining, the potential impact on land usage, future land use planning, the potential future benefits of a successful mine or mines and the benefits that could accrue from the early exploration stages right through to development and mining. Consultation was provided to representatives of most local stakeholders including Northern Communities, First Nations and Metis Settlements culminating in a well attended wrap up symposium on December 11, 2000 in Edmonton.

The consultation process at the community level to provide background information on the mining sector and the potential impacts and benefits of developing mineral mines was well received. The process is viewed as ongoing as many small communities and individual native groups were not consulted during this first stage of the consultation process.

Most Northern Alberta groups consulted welcome the opportunity to participate in a developing mining sector. Their concern for the environmental impact of one or two mining developments in our lifetime is far outweighed by the potential future economic benefits. Most of the groups expressed a number of concerns including the following:

- Government and industry support for increased residency in Northern Communities, particularly during a mining development, including but not limited to people, jobs and infrastructure.
- Training and education is viewed as paramount to participating, although strong concern was voiced about initiating such programs prior to the real need for the workforce.
- Government support in evaluating areas of high to low mineral potential across all of Northern Alberta in order to make educated and informed decisions when Northern Communities are asked to give their blessing to sterilization of lands under programs such as Special Places 2000.
- Most communities wanted to know what they could do to encourage the development of the mining sector as well as participate in it. Web based lists of subcontractors, 1 to 3 day prospecting courses and support for government geoscience initiatives were most often mentioned for communities to participate in or support.
- Communication and further consultation by both government and industry through all stages of exploration, including early exploration prior to any major developments is perceived as important and provides for a good atmosphere of respect and understanding between the local northern community and industry and government.

Recommendations

Some recommendations for the future advancement of non-energy mineral mines and exploration in Northern Alberta are identified below. This list reflects the topics most discussed during the consultation process but it does not reflect all the possible solutions to some of the barriers that exist preventing mining from becoming a future reality in Northern Alberta. These recommendations are not in any order of importance.

Formation of a Mineral and Land Use Geoscience Initiative for Northern Alberta

- The initiative could focus on support and ongoing participation in the Evaluation of Mineral Potential and Land Use for Northern Alberta. This may include representatives from NADC, AGS, Chamber of Resources, First Nations, Treaty 8, Metis Nation, Industry, Community Representatives and other interested parties. A Geoscience Committee could aid in developing a strategy to assess the mineral potential of Northern Alberta in order to provide Northern Albertans with the needed information and awareness of the mineral potential to aid in all future land use discussions and initiatives. This committee could aid the mining sector in providing a voice at round table discussions that address land use and land classification processes that may result in the sterilization of lands from future development.

Training Initiatives

- Several communities expressed strong interest in commencing 1 to 3 day prospecting courses as soon as possible. With time such an initiative could develop into longer summer courses that could be held at many of the Northern Regional Colleges such as Grande Prairie, Fairview, Athabasca etc. In the longer term expansion and demand could result in college courses for mine training in various trades. This has been an initiative in the NWT with new courses added at Arctic Colleges for employees at the northern diamond mines. Many of the trades currently needed at the oil sands operations in the Fort MacKay region would be applicable to the Non-Energy mining Sector.

Prospecting Assistance Grants

- In jurisdictions such as BC, ON and the NWT prospecting assistance grants are awarded to selected individuals on approved projects to assist in covering such costs as fieldwork and analytical costs. This should be evaluated for northern Albertans.

Mineral Exploration Incentive Programs

- (a) Manitoba is currently in its fourth or fifth year of providing cash back as a percentage of exploration conducted and dollars spent particularly for remote locations in order to aid in offsetting expensive fuel and infrastructure costs. This program for Northeastern Manitoba has supported significant diamond exploration and staking that will likely culminate with the discovery of a new kimberlite field in the near future; (b) The availability of Flow-Through Funds for mineral exploration in Canada. In addition to the 15% added flow through

incentive added by the Federal Finance Minister in October 2000, many provinces have added additional deductions that encourage investment funds to be spent and invested in their province. This added tax benefit was implemented after lobby by the Prospectors and Developers Association of Canada (PDAC) and the mining industry. Alberta could investigate such additional incentives for Alberta exploration and Alberta investors.

Mineral Potential Maps For Northern Alberta

- Preparation of these maps is considered essential for northern communities and aboriginal groups in order to make informed decisions with respect to future sterilization of lands. To prepare these types of maps will require increased government and industry funding for geoscience and mineral deposit information as well as some funds spent on technology. Government and joint government-industry initiatives should be looked at for increased funds.

Communication

- Encourage industry to consult and communicate with local communities and aboriginal groups especially during early stages of exploration. Perhaps once companies start to initiate drilling programs they should be encouraged but not required to consult with the local communities.

Education in Public School System

- The PDAC currently offers "The Mining Show" which is a travelling road show exhibit that promotes mining. This is being sent to remote communities across Canada. It could be possible to offer this exhibit or one with a similar theme. The Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA) could be partner in this effort due to their current programs in the public school system in Alberta.

Web-based Community and Sub-contractor Information

- There are many local communities with excellent web pages that are easy to access and have extensive lists of local businesses and sub-contractors. However, there are as many northern communities, particularly aboriginal communities that have neither web pages nor easily accessible lists of businesses, suppliers and subcontractors. The mining sector explores with much less funding then the oil and gas sector and as a consequence tends to employ small owner operator contractors and businesses in the nearby local communities. Easy access to names of small businesses will generate contracts for northern businesses today during early exploration and during a very difficult mining sector. Think what it will do once the mining sector starts to recover.

Continued Consultation

- The consultation process of visiting northern communities is considered an ongoing activity and should be continued in some fashion to increase awareness and bring the information in to many of the smaller communities and to the smaller native groups who could not be consulted within the scope and budget of this phase of the process.

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Table 1: Value of Mineral Production in Canada by Province.

Province	1998		
	($000)	%	Rank
Ontario	4,993,737	27.2	1
Quebec	3,442,526	18.8	2
British Columbia	2,904,263	15.8	3
Saskatachewan	2,335,192	12.7	4
Alberta	**1,035,021**	**5.6**	**5**
Newfoundland	1,001,581	5.5	6
Manitoba	909,033	5.0	7
New Brunswick	852,218	4.6	8
NT	406,905	2.2	9
NS	339,076	1.8	10
Yukon	116,395	0.6	11
PEI	2,251	—	12
Canada	**18,338,165**	**100**	

Table 2: Value of Mineral Exploration in Canada by Province.

Province Territory	1997		1998		1999		2000	
	$ millions	%	$ millions	%	$ millions	%	$ millions	%
Nfld	71.8	7.8	47.9	7.3	32.3	6.5	23.0	4.6
NS	7.9	0.9	6.5	1.0	4.2	0.8	5.9	1.2
NB	13.4	1.5	10.1	1.5	8.6	1.7	8.5	1.7
Que	173.3	18.8	127.1	19.4	109.1	21.8	77.1	15.4
ON	189.3	20.6	114.8	17.5	85.0	17.0	101.6	20.2
MN	41.4	4.5	29.9	4.6	25.8	5.1	25.0	5.0
SK	56.1	6.1	62.1	9.5	28.5	5.7	35.0	7.0
AB	**28.0**	**3.0**	**27.5**	**4.2**	**17.8**	**3.5**	**17.4**	**3.5**
BC	115.2	12.5	54.5	8.3	42.2	8.4	41.9	8.3
YT	45.6	5.0	20.1	3.1	13.2	2.6	11.8	2.4
NT	179.1	19.4	155.6	23.7	103.2	20.6	119.3	23.8
Nunavut	NA	NA	NA	NA	31.4	6.3	35.7	7.1
Total	**921.0**	**100**	**655.9**	**100.0**	**501.1**	**100.0**	**502.1**	**100.0**
Exploration	**634.4**	**68.9**	**462.8**	**70.6**	**341.2**	**68.1**	**314.9**	**62.7**
Deposit Appraisal	**286.6**	**31.1**	**193.1**	**29.4**	**159.9**	**31.9**	**187.2**	**37.3**

Reference: NRCan Website

Table 3: Application for Metallic and Industrial Permits for Alberta 1993-1999

Year	Permit Applications	Area (ha)
1993	1,132	10,180,000
1994	706	6,350,000
1995	143	1,278,000
1996	589	5,350,000
1997	4,135	37,215,000 *
1998	490	3,816,000
1999		>1,000,000

Grunsky, AGS from Exploration and Development Highlights, PDAC 1999

* There is a 2-year period after staking before filing.

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Grunsky, AGS from Exploration and Development Highlights, PDAC 1999

* There is a 2-year period after staking before filing.

Table 4: Assessment Reports and Exploration Expenditures in Alberta 1993-1999

Year	Number of Reports	Area (ha)	Amount
1993	2	8,965	85,511
1994	8	1,652,345	558,000
1995	31	1,400,000	7,359,614
1996	22	1,699,926	7,411,031
1997	14	547,576	2,750,111
1998	25	2,344,998	16,989,350
1999	750 permits	6,510,353	24,756,862 *

Grunsky, AGS from Exploration and Development Highlights, PDAC 1999 plus unpublished AGS report 2000 by Olson, Edwards, Berezniuk and Grunsky. * There is a 2-year grace period after staking a permit before assessment work filing.

References

Bloy, G.R.and Hadley, M.G. (1989). The development of porosity in carbonate reservoirs. Canadian Society of Petroleum Geologists, Continuing Education Short Course.

Borneuf, D. (1973). Hydrogeology of the Tawatinaw Area, Alberta; Alberta Research Council, Earth Science Report 72-11.

City of Yellowknife (1999). Annual Report 1999.

DIAND (1994). N.W.T. Gold Deposits Workshop, Vancouver, BC. May 25, 1994. Unpublished.

DIAND (1995). Exploration Overview.

Dubord, M.P. (1987). Carbonate hosted Pb-Zn potential of northeastern Alberta and the applicability of Petroleum data for mineral exploration. Alberta Research Council, Open File Report 1987-07.

Dufresne, M.E., Eccles, D.R., McKinstry, B., Schmitt, D.R., Fenton, M.M., Pawlowicz, J.G., and Edwards, W.A.D. (1996). The Diamond Potential of Alberta. Alberta Geological Survey Bulletin No. 63.

GNWT (1993). NT Business Opportunities in the NT Mining and Mineral Exploration Industry 1993 and Beyond. Prepared for the Government of the Northwest Territories Department of Energy, Mines and Petroleum Resources by Avery, Cooper & Co., Nor-Mac Management Services Ltd. and Hornal Consultants Ltd., 1994. 46p.

Hancock, L., (1997). In Mining North Magazine 1997.

Jennings, C.M.H. (1990). Exploration for diamondiferous kimberlites and lamproites. *In* L.S. Beck and C.T. Harps (eds), Modern Exploration Techniques, Saskatchewan Geological Society, Special Bulletin No.10, p.139-148.

MacKeen, B.A., 2000. Education and Training Requirement of the Non-Energy Mining Sector. Prepared for Northern Alberta Development Council. DRAFT.

Mineral Strategy for Alberta (2000). Prepared by Alberta Energy and Utilities Board and Alberta Resources Development, Economic Development and Environment.

Mining Journal, London ,August 4, 1995, Vol. 325, No. 8338. Advertisement Supplement: Country Supplement Northwest Territories. 20p.

Mining Journal, London, December 3, 1993, Vol. 321, No. 8253. Advertisement Supplement: Country Supplement Northwest Territories. 20p.

Natural Resources Canada (1998). Canada Minerals Yearbook.

Olson, R.A., Dufresne, M.B., Freeman, M.E., Richardson, R.J.H., and Eccles, D.R. (1994). Regional Metallogenic Evaluation of Alberta. Alberta Geological Survey, Open File Report 94-08. 150p.

Ozoray, G.E., Wallick, E.I. and Lytviak, A.T. (1980). Hydrogeology of the Sand River area, Alberta; Alberta Research Council, Earth Science Report 79-1.

Pawlowicz, J.J. and Fenton, M.M. (1995a). Bedrock topography of Alberta. Alberta Geological Survey, Energy and Utilities Board, Map 226, scale 1 :2,000,000.

Pawlowicz, J.J. and Fenton, M.M. (1995b). Drift thickness of Alberta. Alberta Geological Survey, Energy and Utilities Board, Map 227, scale 1:2,000,000.

Ross, G.M., Thenault, R. and Villeneuve, M. (1998). Buffalo Head Terrane and Head Craton; What's the difference and does it matter?; Calgary Exploration Group, Annual Calgary Mining Forum, p.19-20.

Sharp, J., (1999). A Tale of Two Territories: Exploration Highlights 1999. *In* Mining North Magazine. Villeneuve, M.E., Ross, G.M., Thenault, R.J., Miles, W., Parrish, R.R. and (1993). Tectonic subdivision and U-Pb geochronology of the basement of the Alberta basin, western Canada; Geological Survey of Canada Bulletin.